REMARKS

In response to the Office Action dated September 12, 2002, Paper Number 9, claims 1, 11 and 16 have been amended. Claims 1-20 remain in the case. Reexamination and reconsideration of the application are requested.

Section 102(b) Rejections

The Office Action rejected claims 1-7 and 11-19 under 35 U.S.C. § 102(e) as being anticipated by Sambonsugi et al. (U.S. Patent No. 6,335,985). The Office Action stated that Sambonsugi et al. disclose all the elements of the Applicants' claimed invention.

In response, the Applicants have amended claims 1, 11 and 16 to more clearly distinguish the Applicants' invention from the prior art. The Applicants, therefore, respectfully traverse this rejection based on the amendments to the claims and the following arguments.

Amended claim 1 of the Applicants' claimed invention includes a system for maintaining a background model of an image sequence having a plurality of pixels. The system further includes a pixel processing module that processes the image sequence on a pixel scale and a prediction module that provides predictions for a value of each of the plurality of pixels. In addition, the system includes at least one refinement module that processes the image sequence on a spatial scale other than the pixel scale.

Sambonsugi et al., in contrast, do not disclose the Applicants' claimed feature of a prediction module that provides predictions for a value of each pixel. In fact, while Sambonsugi et al. do discuss prediction, they merely disclose an object extraction apparatus that performs shape prediction of an object within a frame. In particular, that apparatus includes a prediction section "for predicting a position or shape of the object on the current frame from a frame from which an object region has already been extracted" (col. 4, lines 47-49). This prediction section aids in the extraction of the object from a frame (col. 4, lines 52-54). In addition, the apparatus of Sambonsugi et al. includes object extraction sections that perform a function similar to the prediction section (col. 5, lines 3-

11). Unlike the Applicants' claimed prediction module that provides pixel value predictions, however, the prediction section and object extraction sections of Sambonsugi et al. merely discuss shape prediction.

The Applicants' specification also includes an example implementation of providing predictions for a value of each of the pixels. Specifically, the Applicants' specification sets forth a working example whereby there are two predictions of pixel value are made for each pixel. In addition, one of the predictions is based on actual history and the other is based on the predicted history of a pixel (page 28, lines 3-5). If the actual value of pixel differs from either one of its two predicted values by more than a certain amount, then that pixel is declared a foreground pixel (page 28, lines 2-3).

Amended claim 11 includes a computer-readable medium having computer-executable modules. These modules include a pixel processing module that processes an image sequence on a pixel scale. The pixel processing module further includes a prediction module that calculates predictions for a value of each pixel within the image sequence. In addition, the modules include at least one refinement module that processes the image sequence on a spatial scale other than the pixel scale. In contrast, as noted above, Sambonsugi et al. merely disclose an object extraction apparatus that performs shape prediction of an object within a frame rather than the Applicants' claimed pixel value predictions.

Amended claim 16 includes a method for maintaining a background model of an image sequence having a plurality of pixels. The method includes processing the image sequence on a pixel scale so as to determine a current background model and provide an initial assignment for each of the plurality of pixels. The method also includes calculating predictors for a value of each of the plurality of pixels, and refining the pixel processing by processing on a spatial scale other than the pixel scale to further refine at least one of: (a) the current background model; (b) the initial pixel assignments. On the other hand, as discussed above, Sambonsugi et al. merely disclose shape prediction and not the Applicants' claimed feature of pixel value predictions.

Thus, each of claims 1, 11 and 16 of the Applicants' invention include at least one feature that is neither taught nor disclosed by Sambonsugi et al.. Accordingly, the Applicants respectfully submit that the rejection of independent claims 1, 11 and 16 under 35 U.S.C. § 102(e) as being anticipated by Sambonsugi et al. has been overcome based the amendments and the arguments set forth above. Moreover, rejected claims 2-7 depend from independent claim 1, rejected claims 12-15 depend from independent claim 11, and rejected claims 17-19 depend from independent claim 16 and are therefore also novel over Sambonsugi et al. (MPEP § 2143.03). The Applicants, therefore, respectfully request reexamination, reconsideration and withdrawal of the rejection of claims 1-7 and 11-19 under 35 U.S.C. § 102(e) as being anticipated by Sambonsugi et al. based on the foregoing amendments and arguments.

Section 103(a) Rejections

The Office Action rejected claims 8 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Sambonsugi et al. in view of Jain et al. (U.S. Patent No. 6,263,091). The Office Action contended that Sambonsugi et al. disclose all elements of the Applicants' claimed invention except for disclosing speckle removal. However, the Office Action stated that Jain et al. disclose a technique to isolate foreground and background using speckle removal. Therefore, the Office Action asserted that it would have been obvious to use speckle removal as an enhancement technique because speckle removal is well known in the art to aid in the removal of noise, dirt, breaks and smudges in input images.

In response, the Applicants respectfully traverse these rejections based on the amendments to claims 1 and 16 and the arguments above and below. In particular, Sambonsugi et al. and Jain et al. do not disclose, suggest or provide any motivation for at least one claimed feature of the Applicants' claimed invention. Further, both Sambonsugi et al. and Jain et al. fail to appreciate advantages of this claimed feature.

To make a prima facie showing of obviousness, all of the claimed features of an

Applicants' invention must be considered, especially when they are missing from the prior art. If a claimed feature is not taught in the prior art and has advantages not appreciated by the prior art, then no prima facie showing of obviousness has been made. The Federal Circuit Court has held that it was an error not to distinguish claims over a combination of prior art references where a material limitation in the claimed system and its purpose was not taught therein. *In re Fine,* 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Moreover, if the prior art references do not disclose, suggest or provide any motivation for at least one claimed feature of an Applicants' invention then a prima facie case of obviousness has not been established (MPEP § 2142).

As discussed above, amended claim 1 of the Applicants' claimed invention includes a system for maintaining a background model of an image sequence having a plurality of pixels. The system further includes a pixel processing module that processes the image sequence on a pixel scale and a prediction module that provides pixel value predictions for each of the plurality of pixels. In addition, the system includes at least one refinement module that processes the image sequence on a spatial scale other than the pixel scale. In contrast, Sambonsugi et al. disclose an object extraction apparatus that performs shape prediction of an object within a frame.

As also discussed above, amended claim 16 includes a method for maintaining a background model of an image sequence having a plurality of pixels that includes calculating predictors for a value of each of the plurality of pixels. Once again, Sambonsugi et al. disclose shape prediction and not the Applicants' claimed feature of pixel value predictions.

In addition, Sambonsugi et al. fail to provide any motivation, suggestion or desirability to modify their object extraction apparatus to include a prediction module that calculates predictors for a value of each of the plurality of pixels. One reason for this is that the technique used in Sambonsugi et al. is for performing shape prediction of an object within a frame. There is no suggestion, motivation or discussion in either Sambonsugi et al. or Jain et al. to include pixel value predictions in either system.

Thus, absent any type of motivation or suggestion Sambonsugi et al. cannot render the Applicants' invention obvious (MPEP § 2143.01).

Jain et al. add nothing to the cited combination that would render the Applicants' claimed invention obvious. Jain et al. merely disclose a system and a method for segmenting foreground and background portions of digitized images. The Applicants' claimed feature of a prediction module that calculates predictors for a value of each of the plurality of pixels is not discussed. Consequently, no motivation or suggestion for this claimed feature of the Applicants' invention is provided. Absent this motivation or suggestion, Jain et al. cannot render the Applicants' claimed invention obvious (MPEP § 2143.01).

Sambonsugi et al. and Jain et al. also both fail to appreciate or recognize the advantages of the Applicants' claimed feature of a prediction module that calculates predictors for a value of each of the plurality of pixels. More specifically, the use of multiple predictors "provides the pixel processing module 310 with the ability to accurately maintain a model of the background even if the background is briefly concealed by a foreground object" (page 28, lines 11-13). For example, if an actual pixel history and a predicted pixel history are used as two predictors for a value of each pixel, if one predictor becomes corrupted the other predictor will continue to predict the background (page 28, lines 13-15). Neither Sambonsugi et al. nor Jain et al. discuss or appreciate these advantages of the Applicants' claimed feature of a prediction module having pixel value predictions.

The Applicants, therefore, submit that obviousness cannot be established since neither Sambonsugi et al. nor Jain et al. disclose, suggest or provide any motivation for the Applicants' claimed feature of a prediction module having pixel value predictions. In addition, both Sambonsugi et al. and Jain et al. fail to appreciate advantages of this claimed feature. Therefore, as set forth in *In re Fine* and MPEP § 2142, Sambonsugi et al. and Jain et al., either alone or in combination, do not render the Applicants' claimed invention obvious because the references are missing at least one material feature of

the Applicants' invention. Consequently, because a prima facie case of obviousness cannot be established due to the lack of "some teaching, suggestion, or incentive supporting the combination", the rejection must be withdrawn. ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984); MPEP 2143.01.

Accordingly, the Applicants respectfully submit that independent claims 1 and 16 are patentable under 35 U.S.C. § 103(a) over Sambonsugi et al. in view of Jain et al. based the amendments to claims 1 and 16 and the arguments set forth above and below. Moreover, claim 8 depends from independent claim 1 and claim 20 depends from independent claim 16 and are also nonobvious over Sambonsugi et al. in view of Jain et al. (MPEP § 2143.03). The Applicants, therefore, respectfully request reexamination, reconsideration and withdrawal of the rejection of claims 8 and 20.

The Office Action rejected claims 9 and 10 under 35 U.S.C. § 103(a) as being unpatentable over Sambonsugi et al.. The Office Action contended that Sambonsugi et al. disclose all elements of the Applicants' claimed invention including a postprocessing module. Therefore, the Office Action maintained that it would have been obvious for one of ordinary skill in the art to come up with a method wherein the postprocessing module provides enhancement after the pixel processing module and before the frame processing module in order to output a better quality sequence of images.

In response, the Applicants respectfully traverse these rejections based on the amendments to claim 1 and the arguments above and below. In particular, Sambonsugi et al. do not disclose, suggest or provide any motivation for at least one claimed feature of the Applicants' claimed invention. Further, Sambonsugi et al. fail to appreciate advantages of this claimed feature.

As discussed above, amended claim 1 of the Applicants' claimed invention includes a system for maintaining a background model of an image sequence having a plurality of pixels. The system further includes a pixel processing module that processes the image

sequence on a pixel scale and a prediction module that provides predictions for a value of each of the plurality of pixels. In addition, the system includes at least one refinement module that processes the image sequence on a spatial scale other than the pixel scale. In contrast, Sambonsugi et al. disclose an object extraction apparatus that performs shape prediction of an object within a frame.

In addition, Sambonsugi et al. fail to provide any motivation, suggestion or desirability to modify their object extraction apparatus to include a prediction module having pixel value predictions. One reason for this is that the technique used in Sambonsugi et al. is for performing shape prediction, not pixel value predictions. Thus, absent any type of motivation or suggestion Sambonsugi et al. cannot render the Applicants' invention obvious (MPEP § 2143.01).

In addition, Sambonsugi et al. fail to appreciate or recognize the advantages of the Applicants' claimed feature of a prediction module having pixel value predictions. More specifically, the use of multiple predictors "provides the pixel processing module 310 with the ability to accurately maintain a model of the background even if the background is briefly concealed by a foreground object" (page 28, lines 11-13). For example, if an actual pixel history and a predicted pixel history are used as two predictors for a value of each pixel, if one predictor becomes corrupted the other predictor will continue to predict the background (page 28, lines 13-15). Sambonsugi et al. do not discuss or appreciate these advantages of this claimed feature of the Applicants' claimed invention.

The Applicants, therefore, submit that obviousness cannot be established since Sambonsugi et al. do not disclose, suggest or provide any motivation for the Applicants' claimed feature of a prediction module having pixel value predictions. In addition, Sambonsugi et al. fail to appreciate advantages of this claimed feature. Therefore, as set forth in *In re Fine* and MPEP § 2142, Sambonsugi et al. do not render the Applicants' claimed invention obvious because this references is missing at least one material feature of the Applicants' invention. Consequently, because a prima facie case

of obviousness cannot be established due to the lack of "some teaching, suggestion, or incentive supporting the combination", the rejection must be withdrawn. ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984); MPEP 2143.01.

Accordingly, the Applicants respectfully submit that independent claim 1 is patentable under 35 U.S.C. § 103(a) over Sambonsugi et al. based the amendments to claim 1 and the arguments set forth above. Moreover, claims 9 and 10 depend from independent claim 1 and are also nonobvious over Sambonsugi et al. (MPEP § 2143.03). The Applicants, therefore, respectfully request reexamination, reconsideration and withdrawal of the rejection of claims 9 and 10.

In view of the arguments and amendments set forth above, the Applicants submit that claims 1-20 of the subject application are in immediate condition for allowance. The Examiner is respectfully requested to withdraw the outstanding rejections of the claims and to pass this application to issue.

In an effort to expedite and further the prosecution of the subject application, the Applicants kindly invite the Examiner to telephone the Applicants' attorney at (805) 278-8855 if the Examiner has any comments, questions or concerns.

Respectfully submitted,
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

Following are marked-up versions of amended claims 1, 11 and 16:

1. (Once Amended) A system for maintaining a background model of an image sequence having a plurality of pixels, comprising:

a pixel processing module that processes the image sequence on a pixel scale;

a prediction module that provides predictions for a value of each of the plurality of pixels; and

at least one refinement module that processes the image sequence on a spatial scale other than the pixel scale.

11. (Once Amended) A computer-readable medium having computer-executable modules, comprising:

a pixel processing module that processes [the] an image sequence on a pixel scale and further comprising:

a prediction module that calculates predictions for a value of each pixel within the image sequence; and

at least one refinement module that processes the image sequence on a spatial scale other than the pixel scale.

16. (Once Amended) A method for maintaining a background model of an image sequence having a plurality of pixels, comprising:

processing the image sequence on a pixel scale so as to determine a current background model and provide an initial assignment for each of the plurality of pixels;

calculating predictors for a value of each of the plurality of pixels; and

refining the pixel processing by processing on a spatial scale other that the pixel scale to further refine at least one of: (a) the current background model; (b) the initial pixel assignments.